۲۰ یکنوع گندم خارجی بنام جستان نتایج خوب در این منطقه داده است.

۲۱ــ حاصلات گندم بعضی اوقات به ۶۰ سیر گاهی ۱۲۰ سیر در یک جریب میرسد.

۲۲ــ در بیست وشش فیصد زمین مزروعی سروی شده گندم کاشته میشود.

۲۳ــ تناوب زراعتی خوب دران منطقه وجود دارد یعنی ماش سال اول ــ جو سال دوم گندم سال سوم یا گندم سال اول ماش سال دوم گندم سال سوم کاشته میشود.

۲۴ــ دهاقین بامیان خاطر نشان کرد که حاصل عمده انها از گندم می اید.

۲۵ــ وقت زرع نباتات دربین اول ماه مارچ تا ماه می میباشد.

۲۶ــ وقت درو جو درنهائی ماه جولای شروع شده وکچالو درماه اکتوبر درو میگردد.

۲۷ــ دهاقین که وضعی اقتصادی شان خوب بود حاصلات را برای فروخت تا بهار نگاه میکرد.

۲۸ــ اندازه های معین برای تبدیل اموال در بامیان وجود داشت.

۲۹ــ استعمال پارو در تمام ناحیه بامیان ضروری دیده میشد.

۳۰ ــ پاروی حیوانی بهترین پاروی طبعی را تشکیل وتلقی شده پاروی صنعی هم گمان میرفت که بهتر است اما استعمال ان کم بود.

۳۱ــ بعض از پاروی صنعی دران منطقه استعمال شده واگر پاروی صنعی موجود می بود بسیاری ان خریده میشد.

۳۲ــ بسیاری دهاقین اظهار کرد که انها میتوانند پاروی صنعی را بخرند بشرطیکه ان مهیا باشد.

۳۳ــ حیوانات وحشی ضرر زیاد به نباتات زراعتی رسانیده است.

خلاصه

۱- از مطالعه معلوم شد که دریاها منبع مهم آبیاری میباشند.

۲- تقسیمات آب توسط یک گروپ تشکیل شده مردم که حفاظت کانال ها وجوی ها را بدوش گرفته بود اجرا میگردد.

۳- استعمال آب تا یک اندازه زیاد مربوطه دهاقین با موافقه گروپ تشکیل شده مردم بود.

۴- خیلی کم یا هیچ کانال توسط یک نفر تعیین شده نگهبانی ودوباره تیار میشد.

۵- زیاد ترین بند های تقسیمات آب ساده شکل بوده واز سنگ وچوب ساخته شده بود.

۶- سوراخ شدن زمین که توسط تخریب ابیبان می آید خیلی زیاد بوده وطبعاً برای دو هفته یا زیاد ادامه میگیرد. هشتاد وسه فیصد مردم این مشکل را اظهار کرد.

۷- بدون امنیت وحفاظه آب دیگر قیمت وجود نداشت.

۸- بعضی از دریاها خیلی پائین بوده ویا در آخر تابستان خشک میشد به این صورت نباتات زراعتی به آسیب زیاد مواجه میشد.

۹- در نواحی پایان آب چاه وکاریز ها برای تکافوی آبیاری تدریجاً استعمال میگردید.

۱۰- امکان بدست آوردن آب از دریای فولادی توسط ساختن ۵۰۰ سوراخهای پمپ ویک بند مناسب وجود دارد نتیجه این کار مشکل قلت آب در اراضیات ختم حل وفیصله خواهد شد.

۱۱- تقریباً تمام دهاقین احساس میکردند که آنها پول کافی برای تشکیل یک سیستم موثر آبیاری ندارند.

۱۲- پنجاه وچهار فیصد دهاقین از ۴ سالی ۶ سانتی متر آب را بعضی اوقات استعمال کرده اند - تخمین دهاقین -

۱۳- سی وسه دهاقین خاک را تا ۲۰ سالی ۶۰ سانتی متر آبیاری نموده است - تخمین دهاقین -

۱۴- اخذ ونفوذ آب در خاک از ۲ تا ۵ سانتی متر در یک ساعت در پایان بکار رد شد باستخمین دهاقین -

۱۵- آب یاری از یک حوضه زهکش گودال به حوضه زهکش دیگر میرفت.

۱۶- آبیاری حوضه زهکش طریقه عمده ومعمول بود. کچالو وچند دیگر سبزیجات بالای پلوان زرع می گردید.

۱۷- اندازه حوضه زهکش عمده پنجم یا نیمائی جریب بود.

۱۸- مصاحبه که به ۸۲ دهاقین شد معلوم گردید که تمام شان پنج یا زیاد تر جریب زمین داشت.

۱۹- گندم، ماش، جو وشفتل چهار نباتات مهم زراعتی آن منطقه میباشد.

I N T R O D U C T I O N

This survey project started when I was appointed to go into the Bamyan area with a group of Welsh College students from England to study agriculture and act as official interpreter.

To obtain background information about Bamyan, discussions were held with officials of the Ministry of Agriculture and Irrigation. They had no survey or other research reports specifically about the agriculture in that area. Little pre-trip information was gathered.

The time allowed for doing this survey was rather short, yet much was accomplished. Two hundred and sixty farmers were contacted in fifty-two locations. Each location represented a different interview. The questions asked required from one-half to three-quarters of an hour to answer, but the interest of the farmers often made the interviews much longer. In some cases, much time was required in trying to gain the confidence of the farmers, for village people of Afghanistan are very suspicious.

When the questions asked pertained to the land itself, one farm was selected and reported on. Many farmers were present at each location. This accounts for the 260 individuals mentioned above.

Although the work was difficult at times, it was also very successful. It is felt that the information obtained will be of benefit to the Faculty of Agriculture and to Afghanistan as a whole.

I. IRRIGATION PRACTICES

A survey of fifty-two locations in the Bamyan Valley, selected at random, showed that 92 percent of the farmers used river water for irrigation. The other 8 percent used spring water. The main rivers used for irrigation were the Fooladi, Kakrak, and Sorkhdara. The waters of these rivers were diverted by canals to the farmers. The length of the canals from the diversion dams to Bamyan Valley farm land was divided as follows: 13 canals were less than 1 kilometer, 28 were from 1 to 5 kilometers, 7 were from 5 to 10 kilometers, 2 were more than 10, but less than 20 kilometers. Two farmers did not give the distance. The irrigation water was distributed by group agreement and distribution was dependent upon the individual farmer's honesty. (See Figure 1).

Canal maintenance was done each year by the farmers as a group. They had no "ditch" rider, as the term is used in Kabul. A ditch rider is a person who

walks from morning until evening along the canal from the diversion dam to the farmer's field to repair leaks or washouts. The diversion dams in the Bamyan area were made from sod, stones, and mud, and were not very strong. They washed out at least once or twice a year and sometimes more often. They would be out from one day to two weeks until replaced by a group of farmers. These washouts were reported by 79 percent of the farmers interviewed. The remaining 21 percent did not have washouts or did not care to answer. Figure 2 shows the number of reports indicating washouts and the days reported before repair.

There was no charge for water in the Bamyan area except the cost of securing it, and 54 percent of the farmers were able to use any amount they desired. The rest of them had to take turns having ditch water one day a week, except in Taibooti and Jugrakhil in the north and Dasht-e-Esakhan in the southwest, where water was received every ten to twelve days for one day. If, on that day, a farmer was not able to irrigate some of his fields, he would be out of irrigation water from twenty to twenty-four days. When this happened, it was obvious that crops would suffer due to lack of sufficient water.

Seventy-five percent of the farmers felt they had adequate water to irrigate their lands properly. The Dasht-e-Esakhan area, with 1600 jeribs of cultivated land, was in a poor location because the sources of water were the Rast Darah and Chap Darah Rivers. These rivers are fed by melting snows in the mountains and this source was not sufficient to provide adequate water. In this area, the farmers must plant crops which require less water than mung beans or barley.

A shortage of water annually occurs in late summer in the Bamyan area and seriously affects yields. Mung beans and barley were especially affected, as they need much more water than wheat. In the Bamyan area, there was no extra source of water from karizes or wells. Eleven percent of the farmers, however, were able to get extra water for irrigation from other than their regular rivers and springs. For example, Dawoodi and Jugrakhil farmers had to irrigate their lands before there was a shortage of water from the Sorkhdara River which comes from the Bandi Amir area. This river is usually short of water when crops are nearing maturity. At this point, farmers turned to the Fooladi River, whose source is the Kohi Baba mountain, even though this was not as convenient as the Sorkhdara.

Dawoodi and Jugrakhil farmers mentioned that they hoped the governor would help them prepare culverts to divert the water from where the grinding mills are located below Taibooti, for there the water is run to the Fooladi River after turning the millstones. The farmers needed about 500 culverts to be assured of water throughout the growing season.

Dasht-e-Esakhan farmers also said they would be able to have extra water from the Fooladi River if the governor would help them. Ninety-seven percent stated that they do not have enough money to develop their own water system.

Farmers determined when to irrigate by how the plants looked or when water was available. They did not use the "feel method" of the soil as a guide. Farmers who did not have adequate water would wait for 6 to 14 days

between irrigation periods. Forty-two percent of the farmers answered that the availability of irrigation water and the maturity of crops affected their irrigation timing.

The farmers that did have sufficient water were asked, "How much do you put on (your fields) each time you irrigate?" Nine of them answered 0 to 4 cm; 28 answered 4.1 to 6 cm; 15 answered 6.1 to 8 cm. (See Figure 3). Also asked was "How deep does this amount (of water) wet the soil?" Eight of the farmers answered 0 to 30 cm; 20 answered 30 to 45 cm; 13 answered 45 to 60 cm; 7 answered 60 to 75 cm; and 3 answered 75 cm to 1 meter. One gave no answer. (See Figure 4).

According to most farmers, the intake rate of these soils was 2 to 5 cm/hr. Seven of the farmers said that their soils would take 1 cm/hr or less (very slow); four said 1 to 2 cm/hr (slow); sixteen said 2 to 3 cm/hr (medium); twenty-four said 3 to 5 cm/hr (fast); one gave no answer. (See Figure 5). They also said that the water actually stands on the soil less than two hours as a rule. A few said less than one hour. Fifty-six percent answered that the rate was approximately the same for all their basins. The balance noticed only slight difference in rates between basins.

Water was indirectly applied to their basins. That is, the water had to run across one basin to get to the others on 74 percent of the farms. The balance of the farmers used water directly from a ditch to each basin.

II. IRRIGATION METHODS

All farmers in the Bamyan area used flat basin or ditch-basin methods. The basin method was used mostly on wheat, barley, beans, shakhal, and klool. (Shakhal and klool are legumes [vetches] used as green animal feed or dried for storage). The ditch-basin method was used for potatoes (with deep furrow and high ridge), cucumbers, carrots, and other vegetables.

Most farmers believed that the flat basin method was the best for the Bamyan area. Apparently they did not have any thought of changing from basins to open furrows or rows. Ten percent, however, stated that furrows on flat lands would be the best. They said that furrows on slopes have several weaknesses. Some of the most common remarks were:

1. The furrows would wash out quickly.
2. The fertilizer used would be washed out if a heavy rain falls.
3. Making furrows took more time than making basins.

Most farmers felt that furrows would not give them any more planting area nor produce better crops.

In general, the slope of the land was from 0.5 percent to occasionally more than 6.0 percent. See Figure 6 which indicates that most farmers interviewed had slopes of 3.0 percent or less to deal with. These slopes were determined by a hand held at eye level. The average size of the basins was from 0.2 to larger than 0.5 jerib. Most of them plowed each basin as an individual

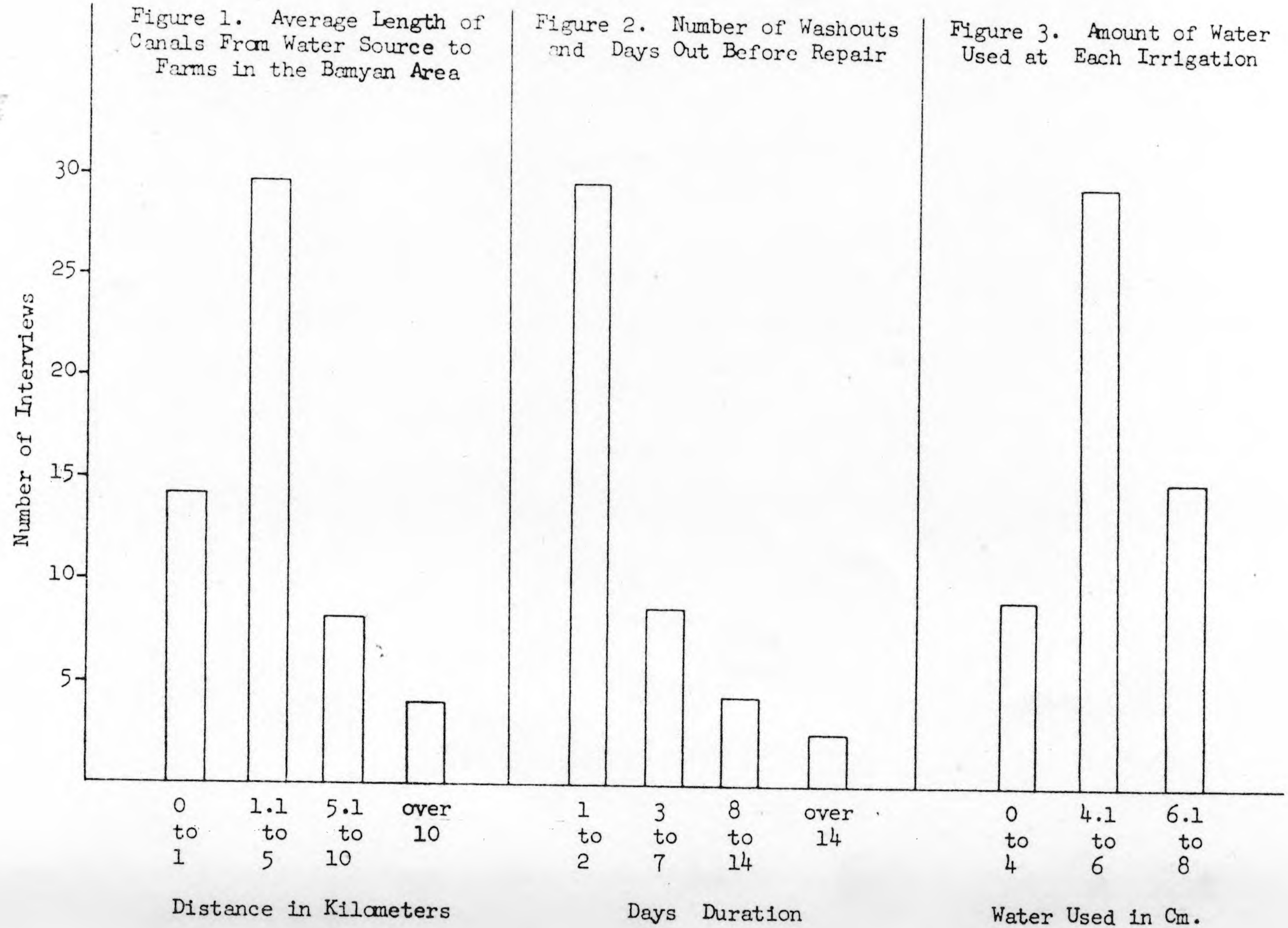


Figure 1. Average Length of Canals From Water Source to Farms in the Bamyan Area

Figure 2. Number of Washouts and Days Out Before Repair

Figure 3. Amount of Water Used at Each Irrigation

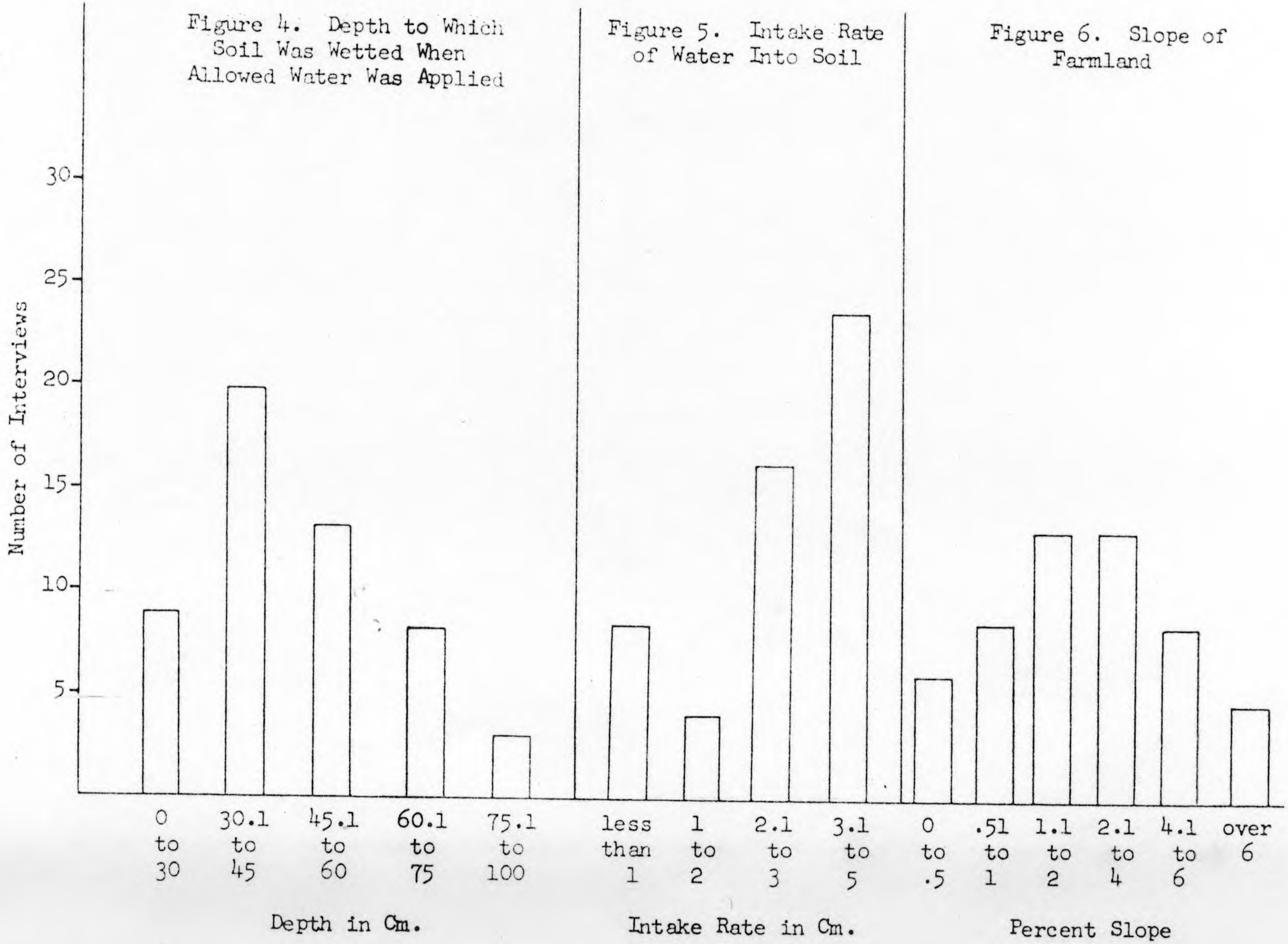


Figure 4. Depth to Which Soil Was Wetted When Allowed Water Was Applied

Figure 5. Intake Rate of Water Into Soil

Figure 6. Slope of Farmland

field, thus avoiding the problem of slope. Most farmers interviewed said they owned more than 5 jeribs of cultivated land, and most of this land was divided into 10 basins or more (full data available in original notes which are too voluminous to place in an appendix).

III. CROPS

The most important crops in this area were wheat, mung beans, alfalfa, shakhal (vetch), klool (vetch), tobacco, and potatoes. Besides these, there were small amounts of clover, onions, carrots, squash, cucumbers, and merel (tara). It is probable that in Bamyan, many other crops and vegetables could be grown, but the people do not seem to be interested in them.

To gain a better understanding of the crops in the Bamyan area, the Director of Agriculture was contacted. He mentioned that the Ministry started its first distribution of Justan wheat in 1345 (1966), this wheat having first been planted as a research project in 1344 (1965). Three hundred forty-two seers of this variety were distributed to the farmers. This wheat requires only a short season and is well adapted to the Bamyan climate. Justan also has good resistance to rust and wind. The Director of Agriculture said they measured a yield of 60 seers per jerib from 4 seers of planted seed or a 15:1 return ratio. If the soil is good, one could possibly receive yields up to 120 seers per jerib.

This year, 1346 (1967), the Ministry of Agriculture also distributed some vegetable seeds to the farmers. They were: eggplant, tomato, radish, squash, watermelon, carrot, spinach, turnip, beet, and different types of beans. The Director said that radishes and squash gave good results in cooler areas, and watermelon, eggplants, and tomatoes grew well in warmer areas around Bamyan. Onions were harvested at two main periods; once for tops, and a second time after the bulb had formed.

Rotation patterns were essentially the same for all farmers. They plant in consecutive years mung beans--1st, barley--2nd, and wheat--3rd; or wheat--1st, mung beans--2nd, and wheat--3rd. A few farmers plant potatoes--1st, klool--2nd, shakhal--3rd. Farmers usually planted about twice as much land to wheat as they did to either mung beans or barley. This was very important to Bamyan farmers because they made the most money from this crop. Their income varies from year to year because of crop rotation, yet the land will not withstand continuous planting of one crop.

On the average, farmers allocated their land as follows:

1. Wheat	46%	4. Potatoes	8%	7. Clover	0.30%
2. Beans	22%	5. Alfalfa	1.5%	8. Shakhal	0.05%
3. Barley	21%	6. Klool	1.1%	9. Tobacco	0.05%

IV. PLANTING AND HARVESTING PRACTICES

The farmers were asked the approximate planting time of their most important crops. The answers were: wheat, between March and April; barley, early March; mung beans, March and April; and potatoes, April and May.

Weather affected the planting date. Most farmers waited until the rains stopped and the soil condition was right. Some of them said they waited until both soil and air temperature were warm. For 50 percent of them, it was necessary to irrigate before planting. The rest of the farmers might also irrigate if there was not enough rain. This last group of farmers had lands suited for holding moisture for a long time. It was also learned that based on the above planting dates, crops would be ready for harvest during the following periods:

Wheat	—— Early August to late September
Barley	—— Mid-July to mid-August
Beans	—— Mid-September to mid-October
Potatoes	—— Early October to late October

If money was not in great need, the farmers stored their crops after harvesting and sold them the following spring. Other farmers would keep some produce for themselves and sell the rest immediately. Some said they exchanged crops for other things they needed for winter, such as fresh or dried fruit. These exchanges occurred in the local bazaars where farmers brought all their exchangeable crops. This was a type of barter system where the crops had previously agreed-upon values, as one related to another.

The approximate exchange rate of crops on a weight basis is presented in Table I:

Table I. Exchange Rate of Certain Crops

1	part dry mulberry	for	2	parts wheat
1	part grape	for	2	parts wheat
1	part grape	for	3	parts beans
1	part grape	for	3	parts barley
5-6	walnuts	for	1	pau* wheat
1	pau pomegranate	for	1	pau wheat
1	pau pomegranate	for	2	pau barley
1	pau pomegranate	for	3	pau mung beans

*1 pau = 0.9 of a pound

V. FERTILIZER

There is little doubt, but that the Banyan area had relatively good soil as compared to other areas of Afghanistan. It would be possible to grow almost any type of crop which is adapted to cool conditions. Yields were not

high, however, unless the farmers used barnyard manure or soil from other locations on their lands.[1]

It was found that 15 farmers had used commercial fertilizers along with other types of fertilizers. Two locations were using human waste, since they had a suitable place to store it. Thirty-four farmers said they had made comparisons to learn the importance of fertilizer. They felt the best natural or local fertilizer was sheep manure and sheep urine taken from the stable. Ashes mixed with barnyard manure was also called a good fertilizer. Soil mixed with barnyard manure was given third place as a fertilizer. Nevertheless, most farmers believed that commercial fertilizer was better than other types. The reasons given were:

1. It did not take as long to put it on the land.

2. The farmers do not have to pay for several day's labor to the donkey owner (to carry manure or soil).

3. Compared with other types of fertilizer, it required a very small storage place.

Most farmers said that some commercial fertilizer was available in their area and all of these farmers showed interest in using it. They asked that the Director of Agriculture in the Bamyan area and the Ministry of Agriculture in Kabul send more fertilizer to their area. Most of the farmers liked urea or ammonium nitrate. They believed that the "grey type" phosphate caused the soil to harden.

Very few of the farmers had loans to buy commercial fertilizer, but most of them also said they would be able to pay for commercial fertilizer if it were available.

VI. ANIMAL PROBLEMS

A wild animal called jaira (a species of porcupine) does a substantial amount of damage at night by eating potatoes and beans. There did not seem to be an easy solution to this problem.

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1. It is a widespread belief in Afghanistan that to get better yields, farmers must have richer soil than is in their own fields, but often the imported soil is not materially different from their own.

18. All of the fifty-two farmers interviewed owned five or more jeribs of land.

19. Wheat, mung beans, barley, and alfalfa were the four most important crops of the area. Other grains and vegetables were grown to some extent.

20. An introduced wheat called "Justan" gave very good results in this area.

21. Yields of wheat sometimes reached 60 or even occasionally 120 seers/jerib.

22. Twenty-six percent of the farm land surveyed was in wheat.

23. A well-established rotation pattern existed in the area. Mung beans--1st year, barley--2nd year, wheat--3rd year; or wheat--1st year, mung beans--2nd year, wheat--3rd year were the two systems used.

24. Bamyan farmers indicated their greatest income was from wheat.

25. Planting time fell between March 1st and early May, depending on the crop.

26. Harvest started by mid-July for barley and lasted through October for potatoes (the only important commercial vegetable in the area).

27. Crops were held for spring sale if the farmer was financially able to do this. Others sold or bartered (traded) their crops at the time of harvest.

28. Fixed barter rates existed in Bamyan for the exchange of farm crops.

29. Fertilizer was considered necessary on the soils in the general area of Bamyan.

30. Barnyard manure was considered the best natural fertilizer. Commercial fertilizer was thought to be even better, but was used very little.

31. Some commercial fertilizer was already used and more would have been purchased if it were available.

32. Most farmers felt financially able to pay for commercial fertilizers if they could secure it.

33. Wild animals have done substantial damage to farm crops.

IRRIGATION,

IRRIGATION METHODS,

CROPS,

PLANTING PRACTICES,

AND

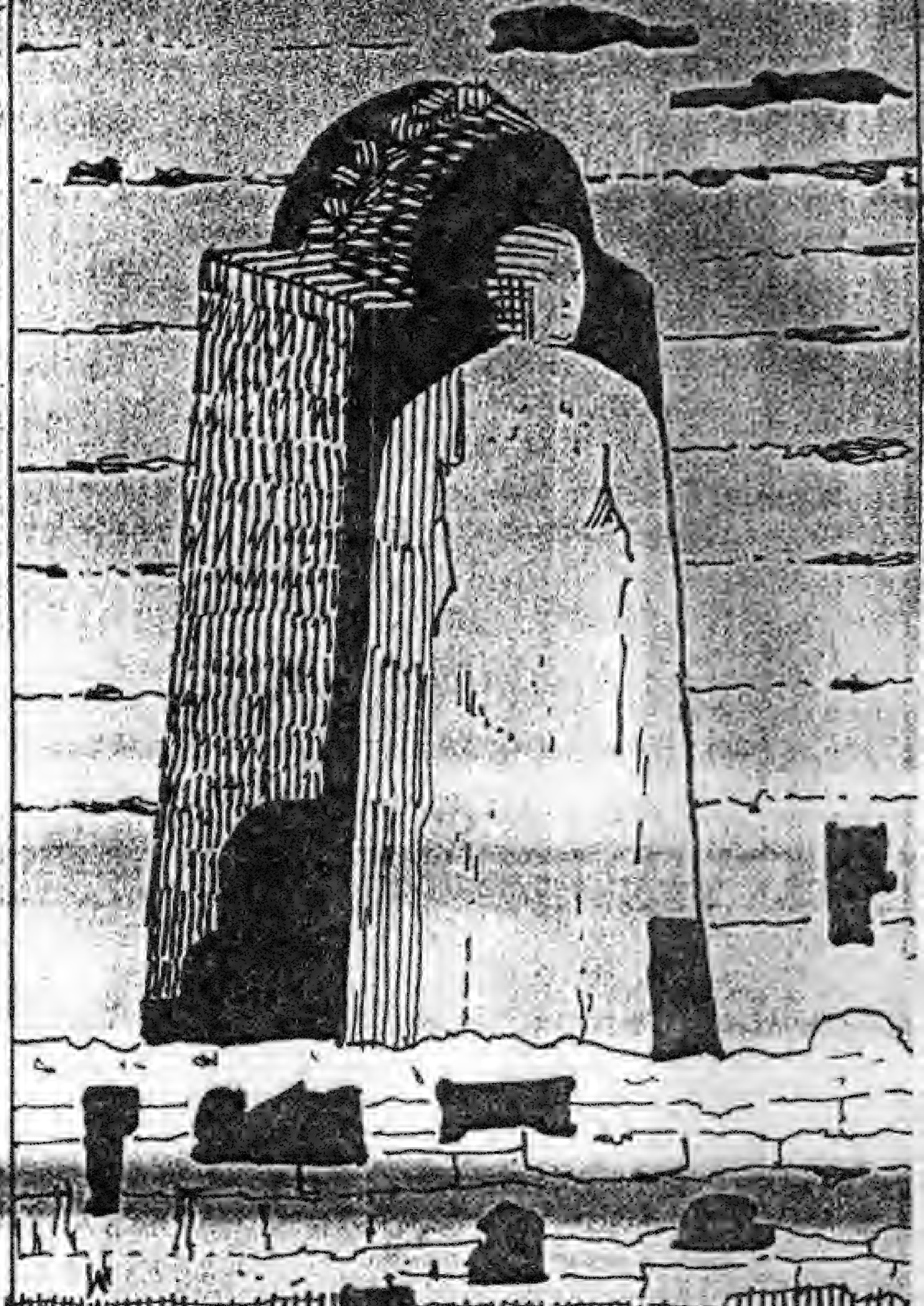
FERTILIZER SURVEY

IN

THE BAMYAN AREA

by

Mir Abbas Frahmand



Technical Bulletin No. 15

KABUL UNIVERSITY
FACULTY OF AGRICULTURE
Kabul, Afghanistan
May, 1969

A C K N O W L E D G M E N T S

A trip to Bamyan was made from July 28 to August 13, 1967 for the purpose of studying irrigation, crops, fertilizer, and planting methods in that area.

I would like to thank Dr. King, Columbia Team; Dr. S. A. S. Gazanfar and Dr. G. H. Benham, Kabul Research Center; and Dr. Shah M. Alekozai, Dean of the Faculty of Agriculture for supporting this project.

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IRRIGATION, IRRIGATION METHODS, CROPS, PLANTING PRACTICES, AND FERTILIZER SURVEY IN THE BAMYAN AREA

by

Mir Abbas Frahmand, Plant Science Technician

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Advisors: H. W. Pillsbury, American Plant Science Advisor

T. L. Loudon, American Agricultural Engineering Advisor

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